

Fish: Concentrations of Key Contaminants

Background

Fish are an excellent source of protein, minerals and vitamins, are low in fat and cholesterol and play an important role in maintaining a healthy, well-balanced diet. However, certain fish may absorb toxic chemicals, such as polychlorinated biphenyls (PCBs) and mercury, from the water they live in and the food they eat.

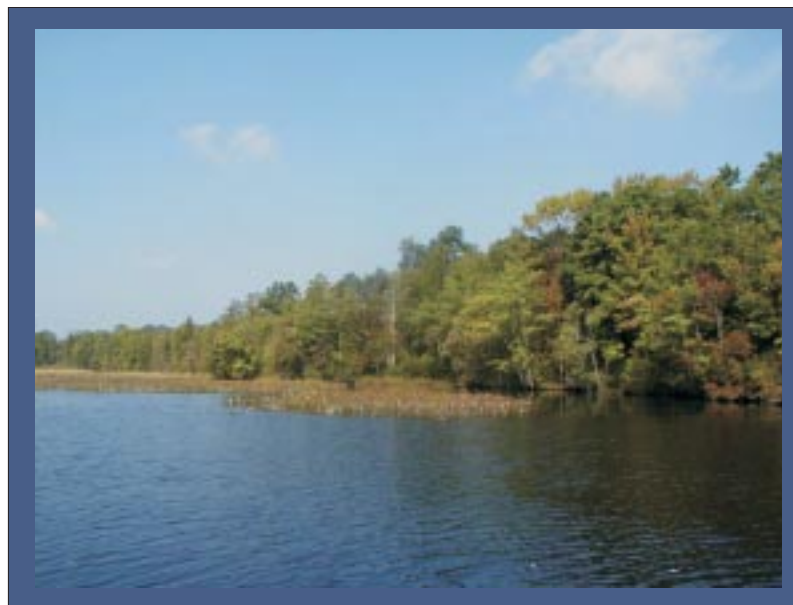
Since 1982, when research began to show elevated levels of potentially harmful contaminants in certain fish and crabs in some New Jersey waters, fish-consumption advisories have been issued to guide citizens on how to safely eat fish. Fish consumption advisories are developed through a scientific process that includes collecting samples of fish from waters throughout the state and analyzing them for various chemical contaminants. The contaminant levels in the fish then are evaluated using federal guidelines for protecting human health. Chemical contaminants such as dioxin and PCBs are classified by the U.S. Environmental Protection Agency as probable cancer-causing substances in humans. Elevated levels of mercury can pose health risks to the human nervous system, particularly to developing fetuses. Since levels of contaminants may vary from one location to another and from one fish species to another, the advisories are also separated by site.

This year, the DEP continued its Routine Monitoring Program for Toxics in Fish, the primary goal of which is to update the fish consumption advisories for certain recreationally caught species in specific geographic areas. Additionally, data that is collected will be used for natural resource management, hazardous site characterization, water quality assessment, natural resource damage claims, and Total Maximum Daily Load (TMDL) development.

Due to the large number of water bodies in the state, the sampling is divided into five broad water regions on a recurrent five-year cycle. The five regions are Passaic Region, Marine/Estuary Region, Raritan Region, Atlantic Coastal Inland Waterways Region, and Upper and Lower Delaware River Region.

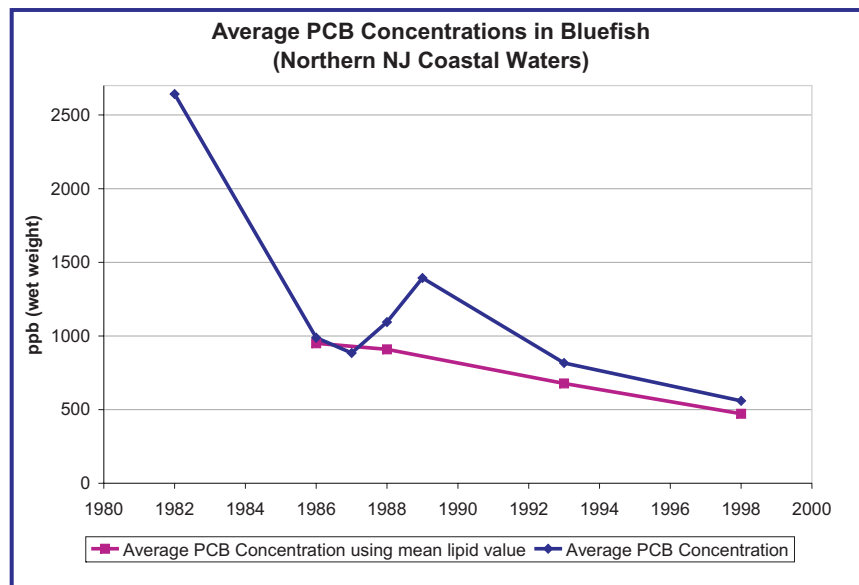
Work currently is being done on the estuarine/marine component, which reflects Year 2 of the five-year plan. Sampling began in the summer of

2004 and continued through the early fall of 2004. This allowed for the capture of fish and shellfish that migrated into the estuary and spent the summer there, increasing the possibility that contaminants accumulated in their fat. Laboratory analysis of the collected samples has begun, and draft data is expected to be available in May 2005. The final report is expected



to be available by November 2005.

Mercury is a toxic metal that has been used in a number of products such as thermometers and electrical switches. There are many natural and man-made sources of mercury in the environment including the burning of fossil fuels such as coal, incineration of wastes, and metal processing and manufacturing. Mercury discharged to the environment can end up in local water bodies. Mercury accumulates in fish tissue through the aquatic food chain from the food that fish eat. Above certain levels, mercury can damage the nervous system, particularly in unborn and young children, resulting in learning and developmental delays. With regular consumption, even



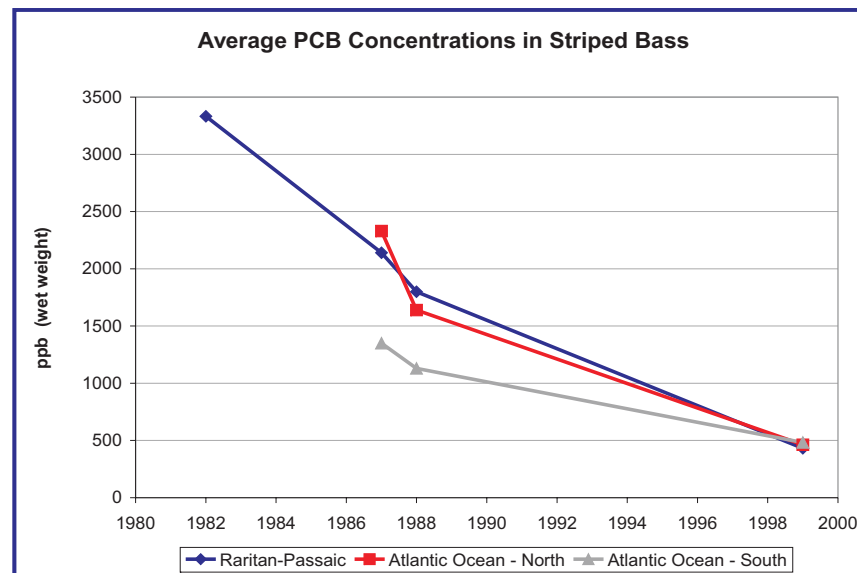
low amounts of mercury may cause subtle effects on the central nervous system in both children and adults. In addition, long-term consumption of fish with elevated levels of mercury by adults and older children may result in adverse health effects, including neurological damage.

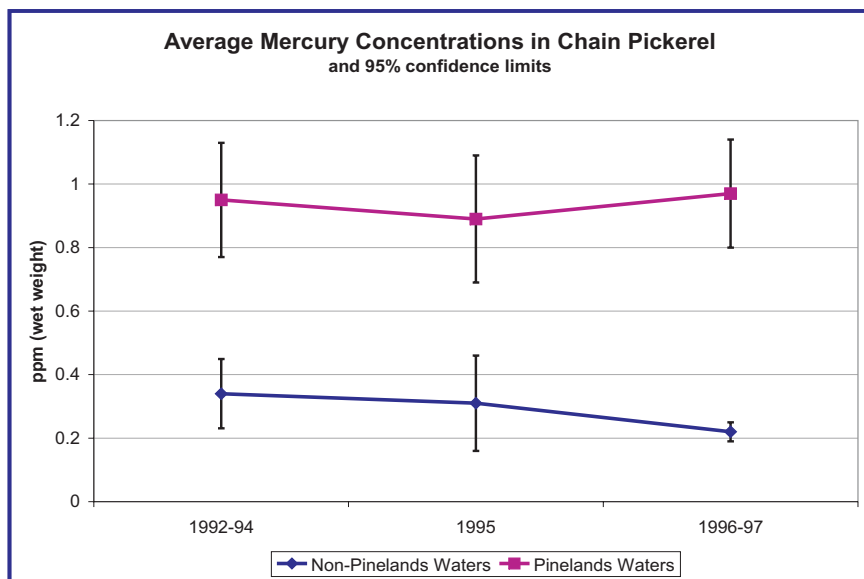
PCBs were produced commercially for industrial application in heat transfer systems, hydraulic fluids and electrical equipment. They were later incorporated into other uses such as printing inks, paints and pesticides. The manufacture of PCBs was stopped in 1979 as a result of evidence that PCBs build up in the environment and cause harmful effects. PCBs tend to stay mostly in soil and sediment, but also are found in the air and water. Once they enter the food chain, they have a tendency to absorb into fat tissue, building up to levels that are hundreds of thousands of times higher than the levels in the surrounding water. When people consume fish that already have accumulated PCBs, the PCBs then accumulate in their bodies. PCBs have been shown to cause cancer in animals, and there is evidence

that PCBs may cause cancer in exposed humans. PCBs also have been shown to cause a number of other serious health effects, including effects on the nervous systems of developing fetuses, the immune system and the reproductive system. Studies have shown that unborn and young children are most at risk to PCB exposure.

Status and Trend

The charts below show the data collected on average concentrations of PCBs and mercury in several different species. Data indicate PCB levels have declined in some species and regions examined since the 1979 ban on PCB manufacturing. (See "Average PCB Concentrations in Bluefish" and "Average PCB Concentrations in Striped Bass"). Both lines show a steady decline in PCB concentrations, although the striped bass data show a much steeper decline in PCB concentrations.



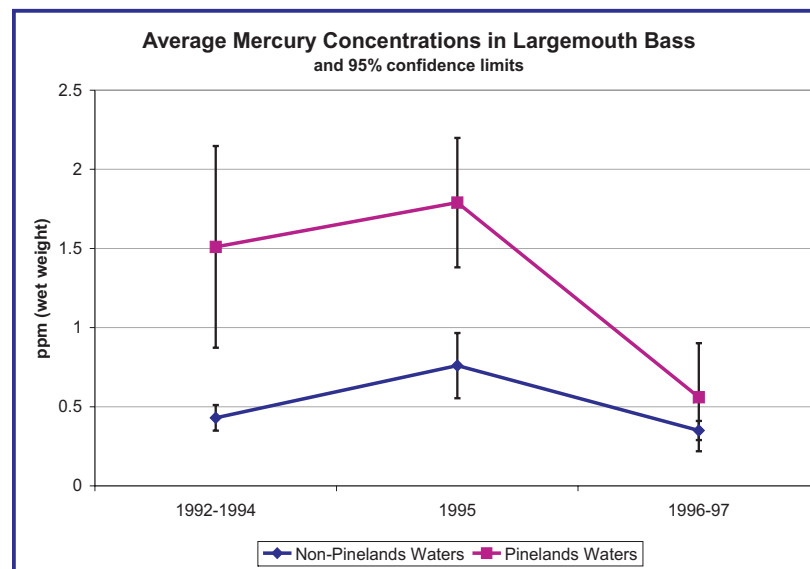


There does not seem to be a trend in mercury concentrations in either chain pickerel or largemouth bass, but the concentrations of mercury are markedly higher in Pinelands waters in both species. (See “Mercury Concentrations in Chain Pickerel” and “Mercury Concentrations in Largemouth Bass”). It is believed that Pinelands water-quality characteristics such as pH and dissolved organic carbon may lead to increased mercury bioaccumulation. More recent data, collected in 2002, also have shown no apparent trend in mercury concentrations in largemouth bass in the Passaic region.

Outlook and Implications

A number of steps have been taken by both the state and federal government to reduce levels of contaminants, such as PCBs, in the environment. In addition to the ban on PCB manufacturing, many hazardous waste sites have been cleaned up, proper disposal measures have been implemented, and sources continue to be identified for remediation. These steps should lead to the continued decline of contaminants such as PCBs in fish.

Additional data are needed to determine long-term trends in mercury levels in fish. DEP has an ongoing monitoring program that will help support trend



analysis. Several actions have been taken to curb mercury emissions in New Jersey, including reductions in mercury releases from incinerators and other sources, as well as planned reductions in releases from in-state power plants and industrial sources. These actions will reduce mercury loadings from local sources in the state. However, regional and global sources, especially coal power plants, remain a significant source of mercury via atmospheric deposition.

More Information

www.state.nj.us/dep/dsr/njmainfish.htm
www.state.nj.us/dep/dsr/advisory_updates.htm
www.state.nj.us/dep/dsr/final-workplan.htm
www.epa.gov/ost/fish/

References

Much of the information in this report was provided by the DEP Division of Science, Research, and Technology and the “Final Work Plan for the Routine Monitoring Program for Toxics in Fish: Estuarine and Marine Waters” June 2004.